

# Bacteria TMDLs in the Cedar and Licking Run Watersheds

Second Public Meeting  
October 23, 2003



# Presentation Overview

- 1. Overview of Virginia's TMDL Program**
2. Applicable Water Quality Standard
3. Cedar and Licking Run Impairments

# What is a TMDL ?

- TMDL stands for **Total Maximum Daily Load**
- A TMDL is a **pollution budget**
- A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet **water quality standards**
- A TMDL includes an **allocation** of that maximum amount to the pollutant's sources

# TMDL Equation

A TMDL is summarized as:

$$\text{TMDL} = \text{Sum of WLA} + \text{Sum of LA} + \text{MOS}$$

Where:

- TMDL = Total Maximum Daily Load
- WLA = Waste Load Allocation (point sources)
- LA = Load Allocation (nonpoint sources)
- MOS = Margin of Safety

# How is a TMDL developed?

- Identify all sources of a given pollutant within the watershed
- Calculate the amount of pollutant entering the stream from each source
- Calculate the pollutant reductions needed, by source, to attain water quality standards
- Allocate the allowable loading to each source and include a margin of safety

# When are TMDLs needed?

- State and federal law require TMDLs to be developed for **impaired** waters
- Impaired waters do not meet applicable **water quality standards** (WQS)
- Waters that do not meet WQS do not support their **designated use(s)**
- For bacteria impairments, the designated use that is affected is the **recreational use**

# Regulatory Basis of TMDLs

- TMDLs required by Federal and State law
  - 1972 Clean Water Act (CWA), Section 303(d)
  - 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA)
- 1998 lawsuit filed by the American Canoe Association and the American Littoral Society against EPA for failure to comply with CWA §303(d) in Virginia
- 1999 Consent Decree requiring EPA and Virginia to complete 636 TMDLs by 2010

# Regulatory Requirements

- Both state and federal law require:
  - Establishment of water quality standards
  - Monitoring of water quality in surface waters
  - Assessment of water quality in surface waters
  - Listing of waters that do not meet water quality standards (impaired waters)
  - Development of TMDLs for impaired waters
- State law requires, and federal law recommends:
  - Development of a TMDL Implementation Plan



# **Roles of DEQ and DCR in TMDL and IP Development**

- DEQ is the lead for TMDL development, including submittal to EPA
- DCR is the lead for TMDL Implementation Plan (IP) development
- DEQ is responsible for ensuring public participation in the TMDL program

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# Water Quality Standards

- Water Quality Standards (WQS):
  - set by states and approved by EPA
  - set **numeric** and **narrative** limits on pollutants
  - consist of **designated use(s)** and water quality **criteria**
- Purpose of WQS:
  - **protection** of 5 designated uses (aquatic life, fish consumption, shellfish, recreation, drinking water)
  - **restoration** of state waters to meet criteria

# Applicable Designated Use

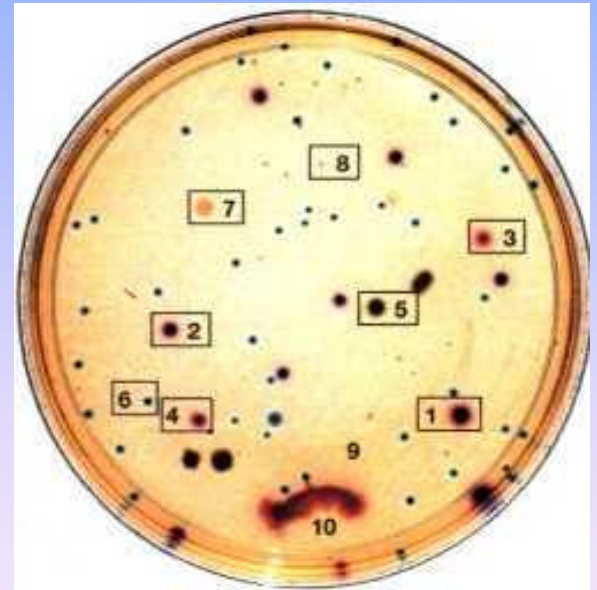
- All surface waters in Virginia are currently designated for **primary contact recreation** (e.g. swimming)
- In March 2003, a **secondary contact recreation** use designation (e.g. wading, fishing) was added to the WQS
  - Five times the primary contact criteria
  - Individual waters will only be considered for reclassification after TMDL implementation has been tried using reasonable BMPs
  - Effective date pending EPA approval

# Pollutant of Concern

- *Fecal bacteria* are found in the digestive tract of humans and warm blooded animals
- Fecal bacteria are an indicator of the potential **presence of pathogens** in waterbodies
- The presence of fecal bacteria in water samples is a strong indicator of recent **sewage or animal waste contamination**

# Sampling for Bacteria

- Stream samples are collected in sterile 125 mL sample bottles
- Samples are filtered to deposit bacteria on filters
- Filters are incubated, allowing individual bacteria to grow into visible colonies
- Colonies are counted to give a concentration of colony forming units (cfu) per 100 mL



# Old Criteria

- Indicator species: **fecal coliform**
  - used in listing Cedar and Licking Runs
- **Instantaneous max:**  
**1,000 cfu/100 mL**
- **Geometric mean:**  
**200 cfu/100 mL**
- Applicable for data sets with 1 or fewer samples in 30 days
- Applicable for data sets with 2 or more samples in 30 days
- Used in **water quality assessment** because monitoring is usually conducted bimonthly
- Used in **TMDL development** because model output is usually daily

# New Criteria

- Indicator species for freshwater: *E. coli*
  - change in indicator species from fecal coliform to *E. coli* (fresh water)
  - *E. coli* bacteria are a **subset of fecal coliform** bacteria and correlate better with swimming-associated illness
- **Instantaneous max:**  
**235 cfu/100 mL**
- **Geometric mean:**  
**126 cfu/100 mL**
- Applicable for all data sets; no samples may exceed the maximum
- Applicable for data sets with 2 or more samples in a calendar month



# Interim Criteria

- Indicator species: **fecal coliform**
  - will be phased out when 12 *E. coli* observations available or after June 30, 2008, whichever comes first
  - will not be used to assess compliance
- **Instantaneous max:**  
**400 cfu/100 mL**
- **Geometric mean:**  
**200 cfu/100 mL**
- Applicable for all data sets; no more than 10% of samples in a calendar month may exceed the maximum
- Applicable for data sets with 2 or more samples in a calendar month

# Summary of Changes in Primary Contact Criteria

Indicator	Status	Instantaneous Maximum (cfu/100mL)	Geometric Mean (cfu/100 mL)
Fecal Coliform	Old	1,000	200
<i>E. coli</i>	New	235	126
Fecal Coliform	Interim	400	200

- Changes went into effect on January 15, 2003
- Both New *E. coli* and Interim Fecal Coliform criteria apply
- Fecal coliform criteria will be phased out entirely once 12 *E. coli* samples have been collected or after June 30, 2008

# Comparison of the Old Fecal Coliform and New *E. coli* Criteria

Old FC (cfu/100mL)	Interim FC (cfu/100mL)	FC translated to EC* (cfu/100mL)	New EC (cfu/100mL)
200	200	129	126
	400	243	235
1,000		565	

\* Based on regression model between 493 dual data points

Note: FC = Fecal Coliform, EC = *Escherichia Coli*

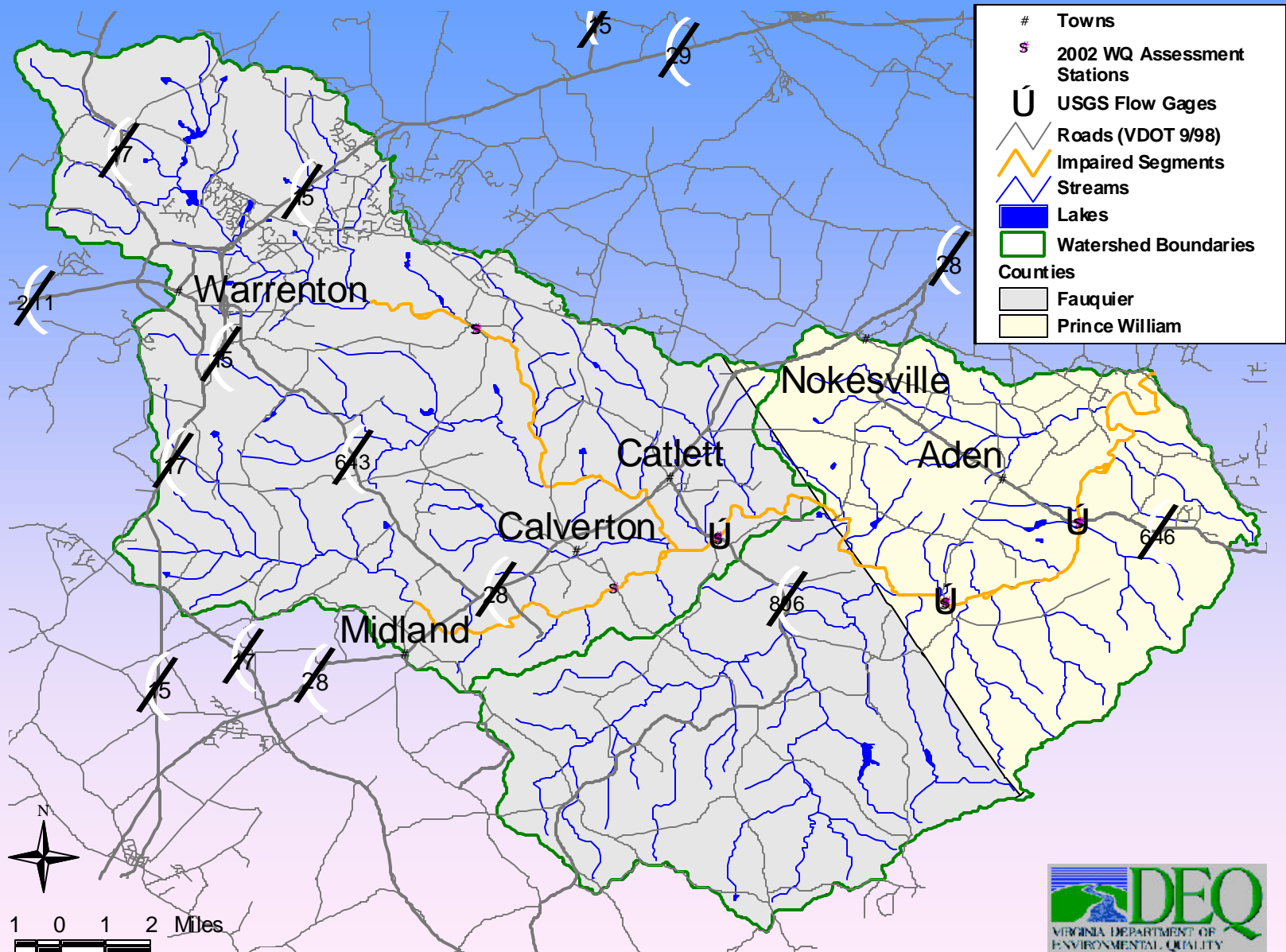
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# Impairments in the Cedar and Licking Run Watersheds

<b>WATER BODY</b>	<b>CAUSE</b>	<b>STREAM NAME</b>	<b>LENGTH (Miles)</b>	<b>YEARS LISTED</b>
VAN-A17R, VAN-A18R	Bacteria	Cedar Run (from Mill Run to Occoquan River)	28.32	1996, 1998, 2002
VAN-A17R	Bacteria	Licking Run (from mouth of Germantown Lake to Cedar Run)	6.58	1998, 2002

# Map of the Cedar Run Watershed



# 2002 Water Quality Assessment Results for Bacteria

WBID	Monitoring Station	Type*	Fecal Coliform**			
N-A17R	1aCER016.46	A,B	4	/	24	P
N-A17R	1aCER025.25	A	5	/	23	P
N-A17R	1aLIL001.43	A	5	/	24	P
N-A18R	1aCER006.00	A	10	/	49	P
N-A18R	1aCER009.52	SS	3	/	11	N

\* Station Types: A = ambient, B = biological, SS = special study

\*\* Impairment Status: P = partially supporting, N = not supporting

# **Bacteria Source Tracking (BST) Study on Cedar and Licking Runs**

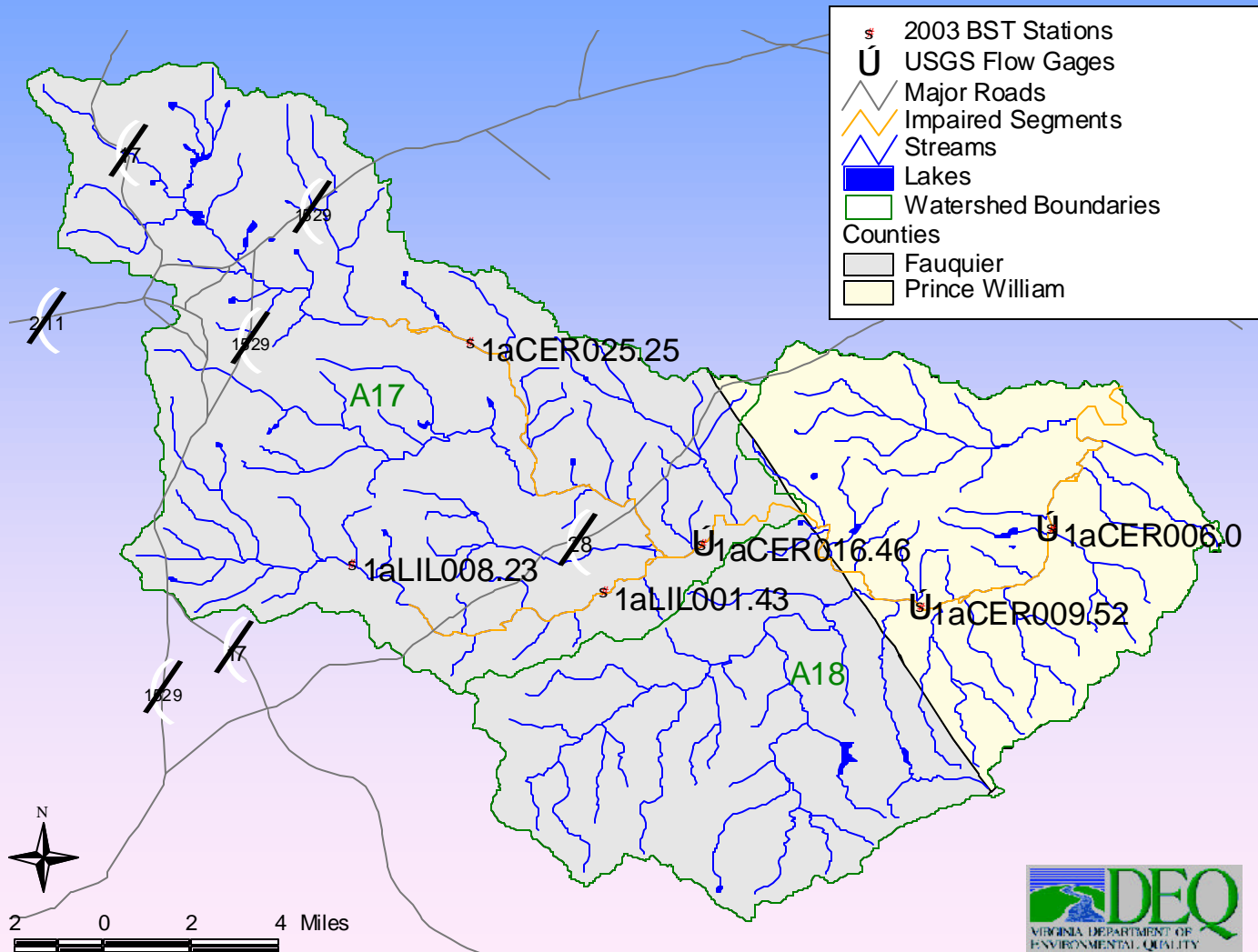
- Monthly sampling for both *E. coli* and Fecal Coliform began at 6 stations in August 2002
- 12 samples will be collected at each station
- DEQ collects ambient samples and ships them to MapTech's Environmental Diagnostics Laboratory (EDL) for analysis
- Upon completion of the BST Study, the Fecal Coliform standard will no longer apply



# BST Study Stations

Station ID	Location	County	Latitude	Longitude
1aLIL001.43	Rt. 616 (Bristersburg Rd.)	Fauquier	38° 37' 15"	-77° 39' 30"
1aLIL008.23	Rt. # 663 (Balls Mill Rd.)	Fauquier	38° 37' 48"	-77° 44' 25"
1aCER006.00	Rt. 646 (Aden Rd.)	Prince William	38° 38' 29"	-77° 30' 44"
1aCER009.52	Rt. 611 (Fleetwood Dr.)	Prince William	38° 36' 57"	-77° 33' 17"
1aCER016.46	Rt. 806 (Elk Run Rd.)	Fauquier	38° 38' 12"	-77° 37' 34"
1aCER025.25	Rt. 602 (Rogues Rd.)	Fauquier	38° 42' 9"	-77° 42' 7"

# Map of BST Study Stations



# DEQ BST Study Objectives

- Simultaneous enumeration of E. coli and Fecal Coliform in ambient water samples
- Collection of samples from known sources
- Antibiotic Resistance Analysis (ARA) of known samples to build a source library
- Identification of sources contributing to each ambient sample using ARA and comparing results to the source library

# DEQ BST Study Status

- Sampling complete at stations on Cedar Run
  - BST report anticipated November 2003
- Licking Run sampling will be complete in December 2003
  - Sampling delayed due to drought

# **Bacteria TMDLs in the Cedar and Licking Run Watersheds**

- First public Meeting
  - July 10, 2003, Catlett, VA
- Second Public Meeting
  - October 23, 2003, Nokesville, VA
- Final public meeting
  - January 2004, draft report will be available for public comment
- <http://www.deq.state.va.us/tmdl/>

# **Bacteria TMDLs in the Cedar and Licking Run Watersheds**

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